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ABSTRACT

This study investigates the relationship between selected student characteristics and an indicated preference for self-directed study. Additional relationships between academic achievement, self concept, cognitive style, and teacher ratings are also examined. Subjects for the study were 58 students from grades five through eight in a large county school system. Scores from tests of achievement, mental ability, self concept, reflection/impulsivity, and field dependence/independence were used for the analyses. In addition, students were asked their preference for self-directed study in math, English, both subjects, or neither subject. Teachers were also asked to rate each student's ability to profit from this instructional mode. Results indicated significant correlations between field dependence/independence and math and English achievement. No significant correlations were found between reflection/impulsivity and achievement; between cognitive style and self concept; or between preference for self directed study and teacher ratings, cognitive style, achievement, self concept, IQ, race, sex, age, or grade level. The paper suggests that students should not be assigned to self-directed study on the basis of these variables, but that student choice should be taken into consideration. The results suggest that instruction can be improved through the consideration of student needs and student preferences. The need for further research is emphasized. (BD)

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THE RELATIONSHIP OF COGNITIVE STYLE, ACHIEVEMENT, AND SELF-CONCEPT TO AN INDICATED PREFERENCE FOR SELF-DIRECTED STUDY

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THE RELATIONSHIP OF COGNITIVE STYLE, ACHIEVEMENT,

AND SELF_CONCEPT TO AN INDICATED PREFERENCE FOR SELF-DIRECTED STUDY

Individual differences and a concern for ways in which to accommodate these differences in the classroom is a persistent educational topic. Efforts to identify the best teaching methods and to correlate instruction with the amount of student learning produced have been accompanied by increased activity in areas such as independent study, programmed instruction, learning centers, computer assisted instruction, learning activity packages and modular instruction. Concomitantly there is a dearth of empirical studies which identify the particular needs of individual students and ways to best match these with instructional methods. In general, less attention has been devoted to individual difference variables than to the emphasis given to the task variable.

Virtually everyone involved in the process of education has long recognized individual differences, or variation in student learning style. The provision for these differences however has most often taken the form of ability grouping, enrichment, or remedial instruction. The criterion for such individualization has generally been the I.Q. or achievement measures which do not predict the ways in which different students learn best. Generally, modifications and innovations have been primarily concerned with what and when to teach. Uniqueness of the individual dictates that it might be more appropriate to be concerned with how to teach whom.

While teachers have been urged to consider the uniqueness of each student, few direct relationships of student characteristics to instruction have not been delineated in specific terms. Individualizing instruction through the use of self-directed study is well on its way to becoming an accepted procedure in many of the schools in this country, yet there is a paucity of materials available in all but the most recent research journals concerning the prescribing of such techniques. Much of the current literature concerning individualization

repeatedly refers to the optimal matching of teaching styles to learning styles while seldom becoming explicit about the learning styles involved or how they can be identified.

The last decade has brought an increased concern for individual differences as they relate to cognitive processes. It is anticipated that, through an understanding of an individual's uniqueness, more appropriate modifications can be made in the curriculum and instructional techniques. As a result, the concept of cognitive style has emerged to serve as a basis for better understanding individual attributes in approaching cognitive tasks. One's cognitive style identifies ways in which that person processes information and indicates individual predispositions to perceive and to respond in particular ways to stimuli. Cognitive style then refers to the characteristic preference an individual exhibits for viewing, organizing, and categorizing the incoming information.

Cognitive styles, or the intra-individual consistencies in cognitive functioning, may be used to further identify individual differences. The most promising cognitive style constructs are field-dependent/field-independent styles and reflective/impulsive cognitive styles. Studies indicate that performance differences between style groups reflect differences in cognitive and perceptual processing of task information. This preferred style of interacting with the environment seems to be a stable and consistent intra-individual characteristic.

The cognitive style construct may be useful in explaining student variability. Studies have found that certain styles are related to achievement in reading and mathematics and indicate that cognitive style may be a variable in success or failure. Cognitive style may also influence the amount of structure that is desired in the instructional setting. It has been further contended that cognitive styles moderate the learning from educational treatments and further that cognitive style can be a consequence of a procedure or

a factor in its effectiveness.

If the growing body of knowledge regarding cognitive style and student learning is correct, the cognitive style construct may become an important consideration in the prescribing of curriculum and instruction. It may be that the adapting of teaching approaches to the strategies of students with different learning styles will facilitate student progress and accomplishment. Quality of instruction should be defined in terms of the degree to which it approaches the optimum mode for a given learner. Since cognitive style is one of the individual difference variables that influences cognitive behavior, it is reasonable to expect that, through the use of cognitive style identification, instructional techniques such as self-directed learning may be more effectively prescribed. There already is evidence that some students can learn quite well through self-directed learning efforts while others may need more structured instructional environments.

This study was basically a correlational and descriptive one to investigate the relationship of selected student characteristics to an indicated preference for self-directed study.

It also attempted to determine if there are significant differences in achievement among various cognitive styles, to examine self-concept levels and cognitive style and to determine whether there is a significant relationship between a student's preference for self-directed learning and the teacher's evaluation of the student's ability to engage in this instructional mode. The overall purpose was to provide data to assist in the improvement of instruction through better meeting individual learning needs and to determine whether self-directed study should be prescribed without regard for cognitive style or the student's expressed preference.

A sample of fifty-eight subjects participated in the study and consisted of middle school students in a large county system. The group consisted of twenty-eight male and thirty female students and contained both black and white

students in fifth through eighth grades. The data gathered for the basis of the study was statistically analyzed through the use of a Pearson correlation coefficient matrix, the t-test and chi-square procedures, and the analysis of variance.

Achievement was measured by scores on the Metropolitan Achievement Test, Intermediate Level, Form F for fifth and sixth grade students and the Stanford Achievement Test, Advanced Level, Form A for the seventh and eighth grade students and by teacher evaluation as determined by the semester academic grade entered on the cumulative record. Measure of ability was secured from the Otis-Lennon Mental Ability Tests, Elementary Level, Form J and the Piers Harris Self-Concept Scale was utilized for the self Concept measure.

Two dimensions of cognitive style were examined: reflective-impulsive (as measured on the Matching Familiar Figures Test, Elementary Form) and field-dependent/field independent (as measured by the Group Embedded Figures Test). Preference for instructional mode was indicated by the students choosing one of the following: self-directed study in mathematics, in English, in both mathematics and English, or no self-directed study in either.

In determining the relationship between the student's cognitive style and achievement in mathematics, two indicators of achievement were used. The first was the performance quotient which was computed as the difference between the student's grade level placement and the Total Mathematics score on the achievement test battery. (Table 1) No significant difference was noted between performance quotients of the reflective and impulsive groups in mathematics. However, it was shown that mathematics achievement was significantly related to field-independent/field-dependent cognitive style.

The results of the Pearson correlation coefficients between the mathematics achievement test scores and selected student variables are summarized in Table 2. These coefficients indicated no significant statistical relationship between response time on the Matching Familiar Figures Test for reflective-

impulsive cognitive style and Total Mathematics or mathematics subscores on the achievement test. These findings coincide with the earlier relationships established between cognitive style and the performance quotient in the area of mathematics.

In utilizing the report card grade as a second indicator of achievement, the Pearson correlation coefficients were significant only for the Group Embedded Figures Test score. This correlation is also presented in Table 2. No significance regarding either error or response time on the Matching Familiar Figures Test are shown. Therefore, there was a statistically significant relationship of field-independent/field-dependent cognitive style to achievement as reflected by the mathematics report card grade but not between this grade and the reflective-impulsive cognitive style.

The chi-square procedure was used to determine the distribution of mathematics report card grades among the cognitive style variables and the results are presented in Table 3. No significant difference in distribution was found between the reflective and impulsive subjects and the mathematics report card grades. However, the field-independent and field-dependent styles were significantly related to the mathematics report card grade.

The results do not indicate a relationship between mathematics achievement and the reflective-impulsive cognitive style. Both the performance quotient and the report card grade did have a significant relationship to the field-dependent/field-independent cognitive style variable.

The result of the t-test of significance of English performance to cognitive style is shown in Table 4. This indicated significance with performance and field-independent/field-dependent cognitive style but not with the reflective/impulsive dimension.

Relationships between the reading and English scores to selected student variables were computed with Pearson correlation Coefficients and are presented in Table 5. Two variables, race and the Group Embedded Figures Test score,

were significantly correlated with each of the achievement test subscores as well as to the Total Reading score. The Group Embedded Figures Test score and the I.Q. score had a significant correlation with the English report card grade.

The Chi-square test was used to determine the distribution of the English report card grade among cognitive styles. As shown in Table 6, there was no significance between the reflective and impulsive groups on the English grade. When the field-dependent and field-independent groups were compared in relationship to the English report card grade there was significance. The statistical analysis confirms no significant interaction between the reflective-impulsive cognitive style and English performance, but indicates an interaction with the field-dependent/field-independent cognitive style.

There was a lack of a significant correlation between self-concept and both cognitive style designations. The Pearson Correlation Coefficient, which is summarized in Table 7, indicates significant relationships between the self-concept and the report card grade in both mathematics and English. The self-concept score also had a significant statistical relationship to the Mathematics computation and Spelling achievement scores. The correlation was not significant between self-concept and the Mathematics Total and Reading Total achievement test scores. Therefore, self-concept was related to mathematics and English performance, but only when using the report card grade as the criterion.

The statistical procedures indicated no significant relationship between the preference for self-directed study options and cognitive style, achievement, or self-concepts. Other student variables such as sex of the student, I.Q.scores, race, age, and grade level also did not correlate with any of the four instructional options.

The student preference for self-directed study was compared to the teacher's perception of the student's ability to engage in self-directed study

to determine whether there was significant congruency between these two factors. The chi-square procedure was used to determine the distribution of the two variables, but no significance was demonstrated.

In order to determine the relationship existing between the teacher's perception of the student's ability to engage in self-directed study and other student variables, a correlation coefficient was computed and the matrix is presented in Table 8. Significant correlations were found between the teacher's perception and race, I.Q. Score, and the Group Embedded Figures Test at the .01 level of significance and with the Matching Familiar Figures Test error score at the .05 level.

Data which assists in the identification of student characteristics that are related to the preference for self-directed study are presented in Tables 9 and 10. The mean scores of these student variables (Table 9) indicated that students preferring both mathematics and English in the self-directed format had a higher I.Q. score and those choosing neither had the lowest I.Q. mean score of the four option groups. This same trend was observed with the self-concept. The lowest achievement quotient score means were also found most often in the group selecting neither mathematics or English in the self-directed format.

The distribution of student variables according to preference for instructional options is displayed in Table 10. While not significant, the trend was for the largest group to select both subjects to be self-directed. Yet, this choice never consisted of a majority of the subjects in the sample.

Based on the findings contained in the study, it is felt that students should not be given preference options in using self-directed study and perhaps other instructional methods and should not be forced to conform to the choice of the majority. Since attitude is a factor in instructional effectiveness and there is generally no significant achievement difference attributable to instructional method, self-directed study should not be prescribed without consideration of the the student's preference. The teacher's perception of the student's ability to engage in self-directed study is not a good predictor of the student's preference for self-directed study. Cognitive style, achievement and self-concept do not predispose a student to select a particular self-directed study option and are also not predictors of the amount of structure students prefer.

Curriculum, materials, and/or teachers' cognitive styles may inadvertently build-in success for field-independent students while predisposing the field-dependent student to be less successful in his performance. The field-independent/field-dependent cognitive style dimension can facilitate or hamper the student's efforts in academic activities. In particular, the field-independent cognitive style seems to predispose an individual to achieve in mathematics and English. There is also the possibility that the field-independent student may achieve higher scores than the field-dependent student as a result of having better test taking skills.

Data gathered form the research indicates that a personal value judgment must be made regarding whether to accommodate the student's learning style or to modify the learning style, since research is inconclusive. The data does clearly indicate that the Group Embedded Figures Test and the Matching Familiar Figures Test measure different aspects of cognitive style and therefore cannot be interchanged. In addition, since race and I.Q. scores are correlated with the Group Embedded Figures Test, this instrument may have cultural implications

The level of the student' self-concept does not predispose him to have a particular cognitive style and therefore cannot be used to indicate a preference for self-directed study. It was interesting to note that while report card grades are significantly related to the student's self-concept, achievement test scores are not. This suggests that the report card, as it is now structured and used, may not be the most appropriate method of reporting student achievement for the middle school student. It may also indicate that sutdents with certain cognitive styles may possess personal attributes or characteristics which predispose them to receive higher report card grades.

In summary, the research indicatel that much research still must be carried out on the variables affecting the prescribing of instruction. It appears that self-directed study should not be prescribed without more consideration being given to the student's personal preference and choice until there is evidence to the contrary. The effect of granting or denying the student his instructional preference option should be examined in relationship to the student's acheivement and attitude. Since a majority of the students in this study preferred some self-directed styd, students should be taught skills that are necessary for success with this particular instructional technique. Studies are also needed to determine whether some cognitive styles are inherently less able to utilize certain curriculum materials and to ascertain how they can be modified to become more effective.

The research indicates that assignment to self-directed study should not be predicated upon cognitive style, self-concept, achievement test scores, I.Q. scores, past performance, or the teacher's perception of the student's ability to engage in self-directed study.

The task of determining how the learner's individual differences can be related to the teaching and learning process defines education's task as one of elucidating strategies which will take these individual differences into consideration in such a way as to promote the fullest development of the individual. While success in learning is regarded as a function of instructional procedures, the reverse has received little attention -- that instructional procedures should be a funciton of learner variables. The implication is that giving the learner the responsibility for at least a portion of his own learning and seems a feasible thing to do. Yet few definitive principles and guidelines are available for assisting in the implementation of this procedure. Extensive research efforts are still needed to identify the factors which effect the potential of self-directed learning.

Table 1

A Comparison of Mathematics Performance Quotient and Cognitive Style: Summary of t-Tests

Cognitive Style	N	Mean	Standard Deviation	Standard Error	t-Value
Reflective	29	-.2897	1.999	.371	.96
Impulsive	29	.7552	1.672	.311	
Field-independent	31	.2742	1.843	.331	-3.96***
Field-dependent	27	-1.4370	1.376	.265	

*** $p < .001$

Table 2

Correlations of Mathematics Achievement Scores with Selected Student Variables

Variable	Conc.	Comp.	Appl.	Tot.	Gr.
Age	.3256**	.4362**	-.3903**	.4169**	-.1241
Sex	-.2593*	-.0892	-.3322**	-.2318	.1280
Race	.4211**	.1620	.3835**	.3666**	-.2249
MFFT-Time	-.0493	.0298	-.0027	.0129	.0026
MFFT-Error	-.1993	-.2793*	-.2365	-.2722*	.2231
GEFT	.6528**	.5763**	.6246**	.6828**	-.3834**

* $p < .05$
** $p < .01$

Mathematics achievement score abbreviations are: Conc. - Mathematical Concepts; Comp. - Mathematical Computations; Appl. - Mathematical Applications; Tot. - Total Mathematics; and Gr. - Mathematics Report Card Grade.

Table 3

Cognitive Style and Mathematics Achievement as Reflected by the Report Card Grade: Chi-square Values

Cognitive Style	E	S	N	χ^2	df
Reflective	4	22	3	1.6898	2
Impulsive	2	21	6		
Field-independent	5	24	1	8.8073*	2
Field-dependent	1	19	8		

* $p < .05$

Mathematics report card grade abbreviations are: E - Excellent; S - Satisfactory; and N - Needs Improvement.

Table 4

A Comparison of Reading Performance Quotient and Cognitive Style: Summary of t-Tests

Cognitive Style	N	Mean	Standard Deviation	Standard Error	t-Value
Reflective	29	-.5862	2.438	.453	-.30
Impulsive	29	-.4000	2.314	.430	
Field-independent	31	.4516	2.185	.392	-3.60**
Field-dependent	27	-1.5778	2.097	.403	

* $p < .05$
** $p < .01$

Table 5

Correlations of Reading and English Achievement Scores with Selected Student Variables

Variable	Voc.	Comp.	Sp.	Lang.	Tot.	Gr.
Age	.2079	.2692*	.2448	.2104	.2120	-.0113
Sex	-.2955*	-.1669	.0159	-.0316	-.2292	-.1996
Race	.5238***	.4805***	.3245**	.4640***	.5240***	-.1276
I.Q.	.2955*	.1801	.2543*	.2003	.2471	-.2823*
MFFT-Time	-.0581	-.0917	.0017	.0831	-.0672	-.0149
MFFT-Error	-.1378	-.1237	-.1894	-.2950*	-.0757	.0901
GEFT	.7415***	.6530***	.6155***	.7554***	.7136***	-.3178**

* $p < .05$
** $p < .01$
*** $p < .001$

Reading and English achievement score abbreviations are: Voc. - Vocabulary; Comp. - Reading Comprehension; Sp. - Spelling; Lang. - Language; Tot. - Total Reading; and Gr. - English Report Card Grade.

Table 6

Cognitive Style and English Achievement as Reflected by the Report Card Grade: Chi-square Values

Cognitive Style	E	S	N	χ^2	df
Reflective	4	22	3	1.6898	2
Impulsive	2	21	6		
Field-independent	3	25	4	8.8073*	2
Field-dependent	2	22	4		

* $p < .05$

English report card abbreviations are: E - Excellent; S - Satisfactory; and N - Needs Improvement.

Table 7

Correlation of Achievement Scores wi
and Factor Cluster Score

Ach. Score	Self-Concept	Self Concept 1	2	3
Math. Grade	-.4002**	-.2673*	-.3672**	-.2774*
Math. Concepts	.2311	.1673	.2628*	.1327
Math. Comput.	.2698*	.1270	.2814*	.2155
Math. Appl.	.1133	-.0143	.1564	.0637
Math. Total	.1796	.0596	.2114	.1107
Eng. Grade	-.3939**	-.3168**	-.2650*	-.2392
Vocabulary	.1652	.1745	.2038	.0085
Read. Comp.	.1966	.2808*	.1737	-.0211
Spelling	.2793*	.2585*	.3084*	.1003
Language	.1944	.2278	.1321	-.0931
Read. Total	.2088	.2622*	.2168	.0051

* $p < .05$
** $p < .01$

th Self-Concept
s

Factor Scores 4	5	6
-.3453**	-.3421	-.1743
.2080	.1448	.1010
.1216	.3510**	.2188
.0446	.1659	.0127
.1104	.1984	.1017
-.2799*	-.3420**	-.3370**
.0503	.0744	.0615
.1061	.1243	.1033
.1760	.2005	.1085
.0641	.1695	.1579
.0964	.1116	.0945

Table 8

Correlation Matrix

Variable	A	B	C	D	E	F
Sex (A)	1.0000	-.1111	.0266	.0807	.0221	-.1114
Race (B)		1.0000	.3753**	-.1054	-.1108	.4104**
I.Q. (C)			1.0000	-.1253	.0029	.2757*
MFFT-Time (D)				1.0000	-.6440**	-.0705
MFFT-Error (E)					1.0000	-.2043
GEFT (F)						1.0000
Self-Concept (G)						
Preference (H)						
T. Perception (I)						

* $p < .05$
** $p < .01$

N = 58

G	H	I
-.0390	.0837	-.0438
.1085	-.0477	-.3555**
.0951	-.0862	-.4403**
-.0735	-.1107	-.1960
-.1495	.0739	.2943*
.1764	-.0760	-.3659**
1.0000	-.0343	-.2274
	1.0000	.0001
		1.0000

Table 9

Mean Scores of Student Variables and Indicated Preference for Self-Directed Study

Variable	Math	English	Both M & E	Neither M or E
I. Q.	100.8	102.1	105.0	91.6
Self-Concept	57.8	58.7	60.8	54.3
Ach. Quotient(Math)	-0.26	.20	-0.35	-0.9
Ach. Quotient(Eng.)	-0.81	.18	0.11	-1.13

N = 58

Table 10

Distribution of Student Variables and Preference for Self-Directed Study

Variable	Math N	Math (%)	English N	English (%)	Both M & E N	Both M & E (%)	Neither M or E N	Neither M or E (%)
Age - 12 & Below	8	(14)	5	(9)	13	(22)	7	(12)
Age - 13 & Above	6	(10)	5	(9)	12	(21)	2	(3)
Sex - Male	7	(12)	6	(10)	11	(19)	4	(7)
Sex - Female	7	(12)	4	(7)	14	(24)	5	(9)
Reflective	6	(10)	7	(12)	10	(18)	6	(10)
Impulsive	8	(14)	3	(5)	15	(26)	3	(5)
Field-independent	7	(12)	7	(12)	13	(22)	6	(10)
Field-dependent	7	(12)	3	(5)	12	(21)	3	(5)

N = 58